



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Art Unit 2821

Examiner Vy

:

In re application of

:

VERTICAL CAVITY SURFACE EMITTING
LASER THAT USES INTRACAVITY

Joseph Reid Henrichs

:

DEGENERATE FOUR-WAVE MIXING TO
PRODUCE PHASE/CONJUGATED AND

Serial No. 10/667,761

:

DISTORTION FREE COLLIMATED LASER
LIGHT

Filed September 22, 2003

:

Group 2800

Allowed November 19, 2004

:

ALLOWED CLAIMS (16)
(With Anticipated Numbering)

1. (2) A semiconductor laser cavity, comprising:

first and second reflector assemblies; and

a non-linear semiconductor material between the first and second reflector
assemblies, wherein the non-linear semiconductor material includes at least three
semiconductor active gain regions, and wherein the non-linear semiconductor material
is for intracavity four-wave mixing of photonic radiation from the at least three
semiconductor active gain regions,

wherein the second reflector assembly includes a polyhedral prism waveguide
having a non-reflecting surface facing the first non-linear semiconductor material and
having at least one totally-reflecting surface for transversely redirecting incident photonic
emissions to a different longitudinal location of the polyhedral prism waveguide.

2. (3) The laser cavity of claim 1, wherein the non-linear semiconductor material includes a cubic crystalline non-linear semiconductor material.

3. (4) The laser cavity of claim 2, wherein the cubic crystalline non-linear semiconductor material includes a cubic crystalline non-linear semiconductor material of class F43m.

4. (5) The laser cavity of claim 2, wherein the cubic crystalline non-linear semiconductor material includes a cubic crystalline non-linear semiconductor material of space group 216.

5. (6) The laser cavity of claim 1, wherein the non-linear semiconductor material includes GaAs.

6. (7) The laser cavity of claim 1, wherein the non-linear semiconductor material includes one of InAs, InP, and GaSb.

7. (8) The laser cavity of claim 1, further comprising a fourth semiconductor active gain region for producing photonic radiation, and wherein the non-linear semiconductor material is for intracavity four-wave mixing of the photonic radiation from the four semiconductor active gain regions.

8. (9) The laser cavity of claim 7, wherein the fourth semiconductor active gain region is included in the non-linear semiconductor material.

9. (11) The laser cavity of claim 1, wherein the polyhedral prism waveguide includes a corner cube polyhedral prism waveguide.

10. (12) The laser cavity of claim 9, wherein the first reflector assembly includes a quarter wave mirror stack.

11. (13) The laser cavity of claim 9, wherein the polyhedral prism waveguide includes a right-angle prism shaped polyhedral prism waveguide.

12. (14) The laser cavity of claim 9, wherein the polyhedral prism waveguide includes a conical prism shaped polyhedral prism waveguide.

13. (15) The laser cavity of claim 1, wherein the first reflector assembly includes a mirror stack.

14. (16) The laser cavity of claim 13, wherein the mirror stack includes a quarter wave mirror stack.

15. (17) The laser cavity of claim 1, wherein polyhedral prism waveguide includes fused silica.

16. (18) A method of intracavity four-wave mixing of photonic radiation, comprising:

- providing first and second reflector assemblies; and
- providing a non-linear semiconductor material between the two reflector assemblies of a laser cavity, wherein the wherein the non-linear semiconductor material includes at least three semiconductor active gain regions such that photonic radiation from the at least three semiconductor active gain regions is four-wave mixed within the laser cavity by the non-linear semiconductor material,
- wherein the second reflector assembly includes a polyhedral prism waveguide having a non-reflecting surface facing the first non-linear semiconductor material and having at least one totally-reflecting surface for transversely redirecting incident photonic emissions to a different longitudinal location of the polyhedral prism waveguide.

Notice of Allowability

FEB 18 2005

Application No.

D/667,761

Examiner

Hung T Vy

Applicant(s)

HENRICH, JOSEPH REID

Art Unit

2821

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment filed on 8/30/2004.
2. ☒ The allowed claim(s) is/are 2-9 and 11-18.
3. ☒ The drawings filed on 22 September 2003 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

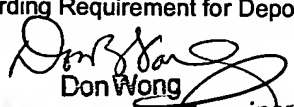
* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413)
Paper No./Mail Date 10/27/04
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____


Don Wong
Supervisory Patent Examiner
Technology Center 2800

Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and /or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.3.12. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

2. The following claim has been amended upon agreement by applicant during a telephone conversation with Mr. Mark G. Knedeisen on November 29, 2004.

In claim 17, line 1, the word "claim 10" has been changed to – claim 2 --.

Reasons for Allowance

3. Claims 2-9,11-18 are allowed.

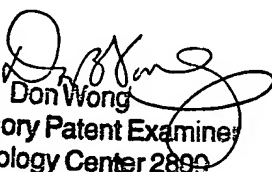
The following is an examiner's statement of reason for allowance:

None of the references of record teaches or suggests the claimed a semiconductor laser cavity comprising, along with all the other claimed feature, at least **three semiconductor active gain regions**, and wherein the non-linear semiconductor material is for intracavity four-wave mixing of photonic radiation from the at least three semiconductor active regions, wherein the second reflector assembly includes a **polyhedral prism waveguide having a non-reflecting surface facing the first non-linear semiconductor material and having at least one totally-reflecting surface.**

4. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance".

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung VY whose telephone number is (571) 272-1954. The examiner can normally be reached on Monday-Friday 8:30 am - 5:30pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DON WONG can be reached on (571) 272-1834. The fax numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 308-7722 for After Final communications.

Information regarding the status of an application may be obtained from the patent Application Information Retrieval (PAIR) system. Status information for published application may be obtained from either private Pair or Public Pair. Status information for unpublished applications is available through Private Pair only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have question on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Don Wong
Supervisory Patent Examiner
Technology Center 2800

Hung T. Vy
Art Unit 2821
October 29, 2004.

Application/Control Number: 10/667,761
Art Unit: 2821

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Interview Summary	Application No. 10/667,761	Applicant(s) HENRICH, JOSEPH REID	
	Examiner Hung T Vy	Art Unit 2821	

All participants (applicant, applicant's representative, PTO personnel):

- (1) Hung T Vy. (3) _____
(2) Mark G. Knedeisen. (4) _____

Date of Interview: 29 October 2004.

Type: a) ☒ Telephonic b) ☐ Video Conference
c) ☐ Personal [copy given to: 1) ☐ applicant 2) ☐ applicant's representative]

Exhibit shown or demonstration conducted: d) ☐ Yes e) ☐ No.
If Yes, brief description: _____.

Claim(s) discussed: 17.

Identification of prior art discussed: _____.

Agreement with respect to the claims f) ☒ was reached. g) ☐ was not reached. h) ☐ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: In the interview, Applicant was encouraged to amend the claim in order to correct dependent claim.

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN ONE MONTH FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

10/29/04

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.

Examiner's signature, if required

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record

A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.

All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:

- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

- 1) A brief description of the nature of any exhibit shown or any demonstration conducted,
- 2) an identification of the claims discussed,
- 3) an identification of the specific prior art discussed,
- 4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
- 5) a brief identification of the general thrust of the principal arguments presented to the examiner,
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
- 6) a general indication of any other pertinent matters discussed, and
- 7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.